ATTACHMENT 2

APPENDIX 3

CAIS MONITORING EQUIPMENT

This attachment describes the air monitoring equipment and methods used to ensure successful air monitoring operations during Rapid Response System operations.

Near Real-Time Gas Chromatography System (MINICAMS®)

Description.

a. *Analytical Method.* The MINICAMS® is an automated gas chromatograph (GC) that operates by alternating between sampling and analysis cycles. During the sample cycle, air is pulled through a solid sorbent tube or sample loop where any airborne analyte is collected. During the analysis cycle, the solid sorbent tube is heated to thermally desorb the analytes, and nitrogen is forced into the sorbent tube to carry the analytes into the capillary column for separation. For the loop sampler halogen selective detector (XSD), nitrogen is forced into the sample loop to carry the analytes into the capillary column for separation during the analysis cycle. The separated analytes are then eluted to the detector. The signal from the detector is analyzed to identify and quantitate any chemical materiel that is present in the sample. If the chemical materiel is detected at or above the alarm setpoint (0.7 of the time-weighted average), then the MINICAMS® alarm is activated. The combined sample and analysis time varies from 3 to 10 minutes, depending upon the MINICAMS® configuration.

b. *Equipment.* The MINICAMS® consists of a monitor (sample collection, analysis, detection, and alarm equipment), a vacuum pump, heated
sample transfer lines, compressed gases, a stream selection system, floppy disk drive (1.44 megabytes), and short range modem.

The vacuum pump pulls the air sample into the MINICAMS® for sample collection. The heated sample transfer lines (heat-traced Teflon tubing that maintain the sample temperature between 50°C and 100°C) ensure that any chemical materiel being transported down the sample line does not condense, become entrapped in any moisture that may have collected in the lines, or become adsorbed onto the walls of the Teflon sample line. Compressed hydrogen and air fuel the flame of the flame photometric detector (FPD). Nitrogen serves as the carrier gas to push the desorbed sample off the solid sorbent tube or sample loop and through the capillary column to the detector.

The stream selection system will allow each MINICAMS® to collect samples from different ports as appropriate. Each of the five MINICAMS® has a different configuration, allowing simultaneous monitoring of eight chemical agent identification set chemicals. The MINICAMS® that monitors for distilled sulfur mustard (HD) will use an FPD; a second MINICAMS® will monitor for bis(2-chloroethyl)ethylamine (HN-1) and tris(2-chloroethyl)amine (HN-3) with an XSD; a third MINICAMS®, set up to monitor specifically for lewisite (L), will use an L-derivitization module and an XSD; a fourth MINICAMS® will use an XSD and a loop sampling module to monitor for cyanogen chloride (CK), phosgene (CG), and chloropicrin (PS); and the fifth MINICAMS® will monitor for chloroform using an XSD.

The printer provides a continuous hardcopy printout of the results of every MINICAMS® measurement. The computer interface module allows the MINICAMS® information to be sent to the computer for electronic data storage.

c. *Monitoring Locations.* Each of the five RRS MINICAMS® will be connected to a separate stream selection device. Two of the ports on the stream selection device will be used to monitor alternately between the appropriate RRS operations trailer workspace and between the carbon filter elements. A third port on the stream selection device will direct monitoring to the inside of the operations trailer glovebox as needed. A fourth port on the stream selection device will be set to monitor the exhaust.

d. *Monitoring Data Generated.* The MINICAMS® will automatically print a concentration report upon the completion of each sample cycle. The concentration report will include the date, time, instrument number, sampling site, error codes, chemical materiel identity, and the chromatographic information. At the beginning of each RRS operational day, the concentration report will be collected from each MINICAMS® and filed in the RRS air monitoring files. When possible, the concentration reports will be backed up on disk and stored separately. The exact storage locations of all of the computer disk data backups will be documented in the RRS air monitoring files.

Depot Area Air Monitoring System

Description. The Depot Area Air Monitoring System (DAAMS) consists of the DAAMS sample station, the DAAMS sample tubes, and the Hewlett-Packard (HP) Dynatherm GC.

a. *Sampling Method.* The DAAMS sample stations will be located immediately adjacent to the MINICAMS® sample point to confirm an HD, L, HN-1, or HN-3 MINICAMS® alarm, or are used alone to provide a historical record of HD, L, HN-1, and HN-3 air concentrations at the carbon filter exhaust. The DAAMS sample

station will use a solid-sorbent tube through which sampled air is drawn. The chemical materiel is adsorbed onto the sorbent, and the tube will be sent to the mobile analytical support platform (MASP) for analysis.

b. *GC Analytical Method.* The DAAMS sample tube is analyzed at the MASP on an HP Dynatherm GC. Upon receipt in the MASP, the DAAMS sample tube will be directly inserted into an HP Dynatherm GC. When the DAAMS transfer tube is inserted into the Dynatherm sample holder, the transfer sorbent tube is heated, and the chemical materiel is thermally desorbed. After the chemicals are separated in the capillary column, they are eluted to the detector. The detector signal is analyzed to identify and quantitate the amount of chemical materiel present in the sample. The results of the sample analysis are printed. The HP Dynatherm GC operator interprets the sample results by comparing the sample results to the daily calibration curve data.

Colorimetric Tubes

Description. For confirmation monitoring of CG, CK, PS, and chloroform vapors, colorimetric tubes will be used. The colorimetric tube sampling system consists of a colorimetric tube and a hand pump. The hand pump is used to draw a known volume of air into a colorimetric tube containing a specific chemical sorbent selected to detect a single chemical compound or class of compounds in the air. Different tubes will be required to monitor for different chemicals. Colorimetric tubes applicable to RRS monitoring will be available from Draeger and ENMET. If the compound being monitored is present in the air sample drawn through the tube, the compound chemically reacts with the sorbent inside the tube to create a visible color change.

The sample period for the hand-pumped colorimetric tubes is measured in terms of pump strokes.

a. *Sampling Method.* Different types of colorimetric tubes will be used at the RRS site to provide confirmation in case of a MINICAMS® for CG, CK, PS, or chloroform. The colorimetric tubes will not be placed at "sample stations"; air monitoring personnel will sample the operations trailer workspace by hand-pumping an air sample through the colorimetric tubes.

b. *Analytical Method.* The colorimetric tubes will be visually inspected immediately after sample collection to determine the presence of stain and associated length, if appropriate, that was produced. The tubes will be used once and then disposed of as hazardous solid waste. Each tube will have an instruction sheet provided with the tube that states exactly how many pump strokes will be performed when collecting the sample.